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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/296,835 04/22/99 WEIMER

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EXAMINER

MM417/1121

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KIELIN, E
ART UNIT PAPER NUMBER

2813
DATE MAILED:

11/21/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
09/296,835

Applicant
Weimer et al.

Examiner
Erik Kielin

Group Art Unit
2813



☒ Responsive to communication(s) filed on Nov 6, 2000

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) 1-40 is/are pending in the application.

Of the above, claim(s) 13-40 is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-12 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☒ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been
☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 5

☐ Interview Summary, PTO-413

☒ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

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DETAILED ACTION

Election/Restriction

1. Applicant's election without traverse of claims 1-12 in Paper No. 10 is acknowledged.
2. Claims 13-40 withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 10.

Claim Rejections - 35 USC § 112

3. Claim 7 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
4. Claim 7 recites the limitation "an underlying layer" in line 4. There is insufficient antecedent basis for this limitation in the claim. Claim 7 depends from claim 1 and there is no mention upon what the dielectric film is deposited.
5. The term "significantly" in claim 7 is a relative term which renders the claim indefinite. The term "significantly" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. It is unclear as to how much oxygen may or may not diffuse into "an underlying layer" to qualify as a significant amount.

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For the remainder of the action, claim 7 will be interpreted as best understood by
Examiner.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

7. Claims 1, 7-8 are rejected under 35 U.S.C. 102(b) as being anticipated by **Emesh** et al. (US 5,728,603).

Emesh discloses forming an oxygen deficient dielectric; subjecting the dielectric film to a wet oxidation in a rapid thermal process (RTP) chamber at a temperature less than 500 C (Abstract); which inherently increases the oxygen content of the film as indicated by reduced leakage current (sentence bridging columns 3-4).

Regarding claim 7, because the underlying layer is Pt which has been pretreated to form an adhesive oxide layer prior to deposition of the dielectric film (column 6, lines 22-27) the oxygen

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inherently does not “significantly” diffuse through the dielectric film, as it cannot diffuse into passivated Pt.

Regarding claim 8, see column 8, Table I.

8. Claims 1-6, 7, 9, 12 are rejected under 35 U.S.C. 102(e) as being anticipated by **Miner** et al. (US 6,114,258).

Miner discloses forming an oxygen deficient dielectric 110 (Figs. 1-3; column 4, lines 21-65); subjecting the dielectric film to a wet oxidation in a rapid thermal process (RTP) chamber (column 5, lines 39-51; Fig. 4) at a temperature range of 400 to 1250 C (column 8, lines 13-32); and post treating the reoxidized dielectric in N₂ withing the RTP chamber (column 10, line 64 to column 11, line 15); wherein the wet oxidation is carried out within the RTP chamber by heating hydrogen and oxygen gases in various ratios to form a mixture of steam and non-steam in various ratios (column 8, line 57 to column 9, line 45) for various times (column 10, lines 18-43; Fig. 13). Both ratios and times clearly anticipate those in the instantly claimed invention.

Regarding claim 7, see Fig. 9b which shows that oxygen “does not diffuse significantly through the dielectric film into the underlying layer.” In other words, the oxygen does not cross the interface (right-hand axis) as determined by SIMS.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 2-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Emesh** et al.

The prior art of **Emesh** as explained above discloses all of the limitations of claims 1-2, 7-8 but does not disclose Applicant's exact temperature ranges. An objective in **Emesh** is keep the temperature below 500 C during fabrication to keep the thermal budget low which is highly desired in the art (Abstract). **Emesh** also discloses that standard art temperatures that anticipate those instantly claimed (columns 1-3)..

These claims are *prima facie* obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

11. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Emesh** et al. in view of **Wolf** (Silicon Processing for the VLSI Era, Vol. 1).

Regarding claim 4, the prior art of **Emesh** as explained above discloses all of the limitations of claims 1-2, 7-8 but does not disclose duration of the RTP, wet oxidation.

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Wolf teaches that rapid thermal processes are carried out for a period of time of seconds to a few minutes (page 57). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use 20-60 seconds because these are typical times for rapid thermal processes and because it has been help that routine optimization with a limited number of variables is *prima facie* obvious. *In re Jones*, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious).

12. Claims 1, 3, 4, 7, 9-10, 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jeng** (US 5,661,072).

Jeng discloses a method of fabricating a semiconductor device comprising, depositing an oxygen deficient dielectric film; performing a stabilizing treatment in O₂ and trans-LC; wet oxidizing the dielectric which inherently increases the oxygen content of the oxygen-deficient dielectric film; and then dry oxidizing (column 3, lines 55-60).

Although **Jeng** does not indicate that the process occurs in a rapid thermal process chamber, this is not given patentable weight because it has been held that to be entitled to weight in method claims, the recited structure limitations therein must affect the method in a manipulative sense, and not amount to the mere claiming of a use of a particular structure. *Ex parte Pfeiffer*, 1962, C.D. 408 (1961).

13. Claims 1-2, 5-7, 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Takemura** (US 5,534,716).

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Takemura discloses a method of fabricating a semiconductor device comprising, depositing an oxygen deficient dielectric film 303 (Figs. 7A-7f); performing a stabilizing treatment in N₂ at 500 to 620 C (column 10, lines 40-42); wet oxidizing the dielectric film at 550 to 650 C (column 10, lines 53-65) which increases the oxygen content of the oxygen-deficient dielectric film; and annealing in nitrous oxide (N₂O) at 600 C. Note that a pyrogenic method is used to form the steam and the ratios of hydrogen to oxygen and steam to total gases anticipates those ranges of the instant invention.

Regarding claim 11, note that the temperature of the wet oxidation may be higher than that used during the stabilizing anneal.

Only the rapid thermal process chamber is not taught, but does not have patentable weight, as noted above, according to the precedent in *Ex parte Pfeiffer*.

Conclusion

Any inquiry concerning this communication from examiner should be directed to Erik Kielin whose telephone number is (703) 306-5980. The examiner can normally be reached by telephone on Monday through Thursday 9:00 AM until 7:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles Bowers, can be reached on (703) 308-2417. The fax phone number for the group is (703) 308-7722 or -7724.

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November 17, 2000

Charles D. Bowers Jr.

Charles Bowers
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